Civil Engineering Design Guide

• Introduction

The Appendix “A” to the contract for A&E Services defines the project-specific scope of the required services. The Unified Facilities Criteria (UFC) 1-300-09N (“Design Procedures”), 1-300-10N (Electronic Design Deliverables) and 3-200-10N (“Design: General Civil / Geotechnical / Landscape Requirements”) provide guidance for the design and presentation of the required services. This Civil Engineering Design Guide further defines the Civil Engineering technical and submittal requirements for Civil Engineers. The design services and products required in the Appendix “A” shall conform to the requirements of the applicable Unified Facilities Criteria, except as modified below.

• Pre-Design Services

• Field Investigation

• Physical and Topographic Surveying of Site

Clearly indicate locations of project benchmarks (BM) and temporary benchmarks (TBM), and provide corresponding information for project horizontal and vertical control. Include note describing BM & TBM type, location, elevations and reference datum. Include sheet number referencing where BM & TBM’s are shown on drawings. Use Station datum unless otherwise directed by the Civil Engineering reviewer.

• Design Criteria

• Specific examples of minimum Civil Engineering Design Criteria that must be accommodated in the development of the project design include:

• Storm Drain Hydraulics:

Storm drain systems shall be designed so that the hydraulic grade line (HGL) does not exceed the crown of the pipe. Surcharging may be allowed upon approval of the Civil Reviewer. When surcharging is specifically approved, limit the HGL to no higher than 12 inches (300 mm) below the top or lowest opening of inlets, catch basins, manholes, and other structures. Regardless of hydraulic considerations, do not decrease the conduit size in the direction of the flow.

• Reinforced Concrete Pipe:

Provide structural design of reinforced pipe in accordance with AASHTO using a minimum H20 (for two-axle truck) loading criteria. Use AASHTO HS20 (for tractor truck with semi-trailer) loading criteria where semi-tractor trailers will be encountered.

• Roof Drain Connections:

Provide an air gap between downspout and storm drain header above finished grade. Provide cleanouts within five feet of the building and at a minimum every change in vertical or horizontal alignment. Wherever possible, locate roof drains to directly connect to manholes, catch basins, or other access structures. Roof leaders shall have no more than one 90 degree maximum horizontal deflection between the building and the first structure. Collection headers may be used to connect multiple roof leaders to the storm drain structure.

- **Sanitary Sewer Laterals or Service Lines:**

  Provide a manhole at the collecting sewer main line for the connection of all 6" (150mm) and greater sewer laterals or service lines.

- **Sanitary Sewer Alignment Conditions:**

  Provide cleanout at 5' (1.5 meters) from face of building. Provide first manhole at a maximum of 300 (91.4 meters) feet from cleanout. Provide manholes at every junction with a change in vertical or horizontal alignment or at a maximum spacing of every 300' (90 meters).

- **General Demolition Information:**

  Remove all utility structures within the building footprint. Remove all piping and conduit with a diameter of 6" (150 mm) and greater. Either remove or fill with flowable fill any pipe and conduit less than (150 mm). Remaining pipe and conduit shall be capped.

- **General Utility Information:**

  No Civil Utilities shall be provided under the Building footprint.

- **Pavement and Curbing Information:**

  Curb alignments and Pavement Edge Radius Returns shall be a minimum of 25' (7.6 meters).

• Design Submittals

• Design Development Submittal

In addition to the requirements proscribed in UFC 3-1.2.2 provide the following:

- **Calculations.**

  - Copies of all preliminary sizing calculations as applicable to items shown on the plans. If plans show layout of pumps and tanks within building, then provide calculations as to how those items were sized.

  - Discuss methodology used to develop preliminary calculations, list all assumptions and known conditions.

- **Additional Data**

  A single Civil legend should be provided on one sheet (preferably sheet C-1). See http://www.lantdiv.navfac.navy.mil/servlet/page?_pageid=6108&_dad=lantdiv&_schema=LANTDIV (Click on CI- Design, CadFiles_Details, Civil_Details, English_Details, LEGEND.DWG) for sample legend.

• Design Prefinal Submittal

In addition to the requirements proscribed in UFC 8-1.2.4 provide the following:

- **Calculations.**

  Include calculations to support all utility systems. If a utility is sized based on a previous study, provide applicable portions of that study. Provide pressure & flow test data, proving that pipes are properly sized; service area map showing future/existing areas and projected flows from each area; storm sewer calculations in tabular format similar to that shown in VDOT Drainage Manual; culvert sizing, tailwater/headwater data. Provide revisions to calculations submitted to State Agencies. If computer programs are used, document methodology of program, include data inputs and program results, do not provide print out of program runs. Provide drainage area maps (to scale), with each area highlighted and labeled, include offsite drainage areas.

- **Erosion & Sediment Control Permit Package.**

  LANTDIV is the reviewing agency for erosion and sediment control plans for Federal projects in Virginia. Applications shall be submitted in accordance with the Erosion & Sediment Control Handbook. Submit plans at 100% review to the Civil Reviewer.

• Design Final Submittal

- **Calculations.**

  Include calculations for all design-bid-build and design-build projects to support changes made since the design prefinal submittal.